

CLAIMS

1. Facility for producing synthesis gas from a solid feedstock including organic matter, said facility including means for circulating a heat-carrying solid providing at least some of the heat necessary for such production, a zone Z1 including pyrolysis and gasification means, a zone Z2 including separation means, a zone Z3 including gasification means, a zone Z4 including separation means, and a zone Z5 including combustion means, characterized in that zone Z1 has means for pyrolysis and gasification of said feedstock in a transported fluidized bed, in that zone Z2 has means for at least partial separation of the effluents from zone Z1 into an essentially gaseous phase and into an essentially solid phase, in that zone Z3 is supplied at least in part with said essentially solid phase and includes dense fluidized bed gasification means for gasification of said essentially solid phase, in that zone Z4 includes means for separating the effluents coming from zone Z3 into an essentially gaseous phase and into an essentially solid phase, and in that zone Z5 includes means for combusting the essentially solid phase coming from zone Z3 and means (15, 22) for transferring the heat-carrying solid coming from said combustion into zone Z1.
2. Facility according to Claim 1 wherein zone Z5 has means for combusting the essentially solid phase coming from zone Z4.
3. Facility according to Claim 1 or 2 wherein said pyrolysis/gasification zone Z1 includes means (2) for supplying a reactive carrier gas, means (1) for introducing said feedstock, and means for injecting the heat-carrying solid.
4. Facility according to one of Claims 1 to 3 wherein said combustion zone Z5 has means (12, 18) for introducing an oxidizing gas and means (15, 23) for transferring the heat-carrying solid coming from said combustion, to zone Z1.

5. Facility according to one of the foregoing claims including means (7) for transferring the essentially gaseous phase coming from zone Z2, to separation zone Z4.

6. Facility according to one of the foregoing claims wherein said zone Z5 includes:

- a first zone Z'5 including transported fluidized bed combustion means for combusting part of the essentially solid phase coming from zone Z3 and/or Z4,
- a zone Z6 for separating the gaseous phase and the essentially solid phase coming from said combustion,
- a zone Z7 including dense fluidized bed combustion means for combusting the essentially solid phase coming from zone Z6 and means (23) for transferring the heat-carrying solid coming from said combustion, to zone Z1.

7. Facility according to one of the foregoing claims wherein zone Z3 includes reactive carrier gas supply means (6).

8. Facility according to one of the foregoing claims wherein zone Z3 includes means (5) for introducing the feedstock.

9. Facility according to one of the foregoing claims wherein said zone Z5 includes means (13, 19) for supplying an additional fuel.

10. Method for implementing a facility according to one of the foregoing claims, said method including:

- a step of processing, in a transported fluidized bed, a solid feedstock including organic matter under pyrolysis and gasification conditions;
- a step of at least partial separation of the synthesis gas and the solid phase coming from said transported fluidized bed step;

- a step of dense fluidized bed processing of said solid phase coming from the separation step under gasification conditions;

- a step of at least partial separation of the synthesis gas and the solid phase coming from said dense fluidized bed step;

- a step of combustion of the solid phase coming from the separation step;

- a step of recycling said heat-carrying solid regenerated in said transported fluidized bed processing step.

11. Method according to Claim 10 wherein the transported fluidized bed processing step is carried out in the presence of a carrier gas reacting with said feedstock and of a hot heat-carrying solid.

12. Method according to Claim 10 wherein said combustion step is carried out under conditions enabling the regenerated heat-carrying solid contained in the solid phase to be brought to a temperature of between 700 and 1100°C.

13. Method according to one of Claims 10 to 12 wherein the heat-carrying solid includes at least one element selected from the group comprised of ores of the dolomite, mica, olivine, trona, borax, bentonite type or their derivatives, or an inert support impregnated by metal salts or by alkaline or alkaline-earth salts, the alumina silicas having an acid nature.

14. Method according to one of Claims 10 to 13 wherein the feedstock has a particle size of between 0.1 and 100 mm.

15. Method according to one of Claims 10 to 14 wherein the reactive carrier gas from the gasification zones includes water vapor or carbon dioxide or a mixture of these two compounds.

16. Method according to Claim 15 wherein said reactive gas includes hydrogen and/or methane and/or carbon monoxide.

17. Method according to one of Claims 10 to 16 wherein the temperature of the transported fluidized bed and dense fluidized bed processing steps is between 600 and 1000°C, wherein the temperature of the combustion step is between 800 and 1200°C, and wherein the initial ratio between the reactive carrier gas and the feedstock is between 0.1 and 5.

18. Method according to one of Claims 10 to 17 wherein the average residence time of the solid particles in the transported fluidized bed is between 0.5 and 20 seconds inclusive and wherein the average residence time of the solid particles in the dense fluidized bed is between 30 seconds and one hour inclusive.

19. Method according to one of Claims 10 to 18 wherein said feedstock is selected from the group comprised of biomass, household and/or industrial waste, industrial or sewage treatment sludge, agricultural residues and by-products, and earth polluted by hydrocarbons.